MOTORS

Cost Reduction Strategies

Improving the Energy Efficiency of Motor Systems

Motor systems are responsible for 63% of all electricity consumed by U.S. industry. Within the manufacturing sector, steel mills and blast furnaces (SIC 3312) account for 4.7% of all motor energy use. A typical steel mill can potentially achieve significant savings by improving motor system efficiency, as shown below.

Did you know...

Turning off a 100-hp standard-efficiency motor when it's not needed—even for just an hour per day—will save more than twice as much as replacing it with a premium-efficiency motor.

Motor Systems in Blast Furnaces and Steel Mills		
Motor System Costs per Year	**Estimated Potential Savings per Year**	**Savings as % of Operating Margin**
$6,000,000	$358,000	2%

U.S. Industrial Electric Motor Systems Market Opportunities Assessment, December 1998

You can identify energy-saving opportunities in motor systems at your mill by conducting a systems analysis and instituting energy-conscious practices.

Systems Analysis

Apply the following screening steps to focus on the subset of your mill's motors most likely to offer the greatest savings opportunities.

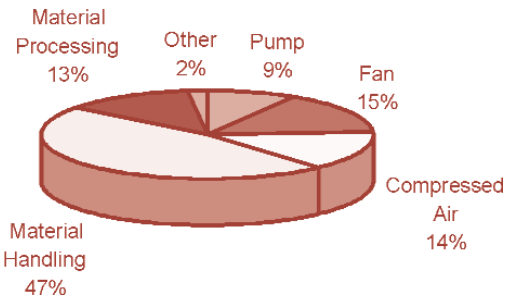
1. Select systems with large motors that run for long periods.

Motors larger than 50 horsepower make up only 8% of the motor population in primary metals industries (SIC 33), yet they account for over 80% of motor energy use in the typical plant. Clearly, the largest motors that run the most should receive priority attention. A good rule of thumb is to select about 25% of your motors for further consideration—making sure to include your largest and busiest.

2. Identify priority load types.

Motors use energy to perform various functions throughout a plant. Fluid handling systems, such as pumps, fans, and air compressors, consume close to 40% of all motor energy used in steel mills. These systems are commonly centrifugal devices and particularly sensitive to system design, so they are strong candidates to provide energy cost savings.

Motor Systems Energy Use in a Typical Steel Mill



Your detailed review should address only those systems identified in the screening steps above. This will minimize use of resources and engineering involvement. Once your in-house engineering staff or a hired consultant has collected and analyzed field measurements, specific solutions to improve system performance can be developed and presented to management. Examples of motor system solutions include using adjustable-speed drives, resizing or repairing equipment, eliminating parallel devices or bypass loops, and eliminating leaks.

Energy-Conscious Practices

The following motor practices are simple, require no investment, and provide immediate savings. These practices may also be applied to motor-driven equipment to further increase efficiency.

1. Establish a new motor purchase policy. Lock in energy efficiency by making it your corporate policy to consider replacing failed motors with more efficient ones. If an oversized motor fails, weigh the merits of replacing it with one that is properly sized for the application, and be sure to factor in expected energy savings over the entire life of the motor. Review motor efficiency specifications when purchasing any rotating equipment.

2. Devise a motor repair/replace policy. In addition to replacement motor availability, consider the following factors when deciding whether to repair or replace a failed motor: original motor efficiency, rewind costs and efficiency loss assumptions, new motor purchase price, motor horsepower rating, energy costs, investment criteria, motor loading, and annual hours of motor operation. For motors of less than 50 horsepower, it is usually most cost effective to replace failed motors immediately. Motors identified by system screening, as discussed earlier, should be evaluated prior to failure on a case-by-case basis. The Department of Energy provides free software to aid you in this evaluation and provide the framework for implementing a repair-versus-replace policy (see below).

MotorMaster+ 3.0
Energy-efficient motor selection and management software

This popular software features motor inventory management, maintenance log tracking, efficiency analysis, savings evaluation, energy accounting, and environmental reporting capabilities. Additional information on motors and free copies of MotorMaster+ 3.0 can be downloaded from the OIT Clearinghouse web site at http://mm3.energy.wsu.edu/mmplus/default.stm

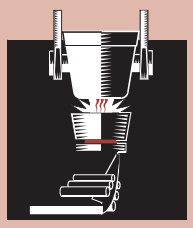
3. Adopt model motor repair specifications. Define model repair specifications for low-voltage induction motors to ensure consistent, high-quality diagnosis and repair. The quality of a motor overhaul is critical to motor efficiency.

4. Monitor power quality. Improper voltage level and voltage imbalance can degrade motor performance, reduce motor life, and decrease reliability. A 1% voltage imbalance, for example, can cause a 5-10% current imbalance. For a motor that is operating near rated load, a 2% voltage imbalance can cause motor tripping or overcurrent. Talk with your electrical supplier about voltage levels and acceptable levels of imbalance.

5. Evaluate adjustable-speed drive performance. Adjustable-speed drives can be a powerful tool in reducing energy use, but use caution. Motor life can be adversely affected by voltage spikes, bearing currents, and additional heating caused by the non-linear, non-symmetrical drive voltages and currents. Avoid negative impacts by taking preventive measures (such as use of filters, short feeder lengths, special cable designs, etc.).

ASDMaster
Adjustable-speed drive evaluation methodology and application software

This software helps you select the right drive for your application. The software can be purchased from the EPRI web site at http://www.epri-peac.com/asdmaster/



Other Resources

OIT Clearinghouse
800-862-2086

www.oit.doe.gov/
bestpractices